

ORGANIC NOMENCLATURE

Organic Molecules

- Composed of carbon, hydrogen and sometimes oxygen and nitrogen
- Hydrocarbons—molecules with only hydrogen and carbon
 - Saturated → all carbon-carbon single bonds
 - Unsaturated → all carbon-carbon multiple bonds (double or triple)
- Prefixes:

# of Carbons	Prefix	# of Carbon	Prefix
1	Meth-	6	Hex-
2	Eth-	7	Hept-
3	Prop-	8	Oct-
4	But-	9	Non-
5	Pent-	10	Dec-

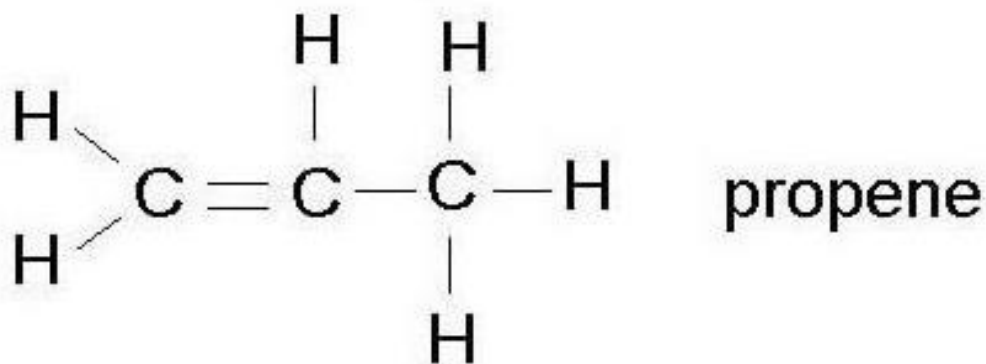
Alkane

- Have all single carbon-carbon bonds
- General formula: C_nH_{2n+2}
- Saturated hydrocarbons
- Name: number of carbon prefix + -ane

Name	Formula	Name	Formula
Methane	CH_4	Hexane	C_6H_{14}
Ethane	C_2H_6	Heptane	C_7H_{16}
Propane	C_3H_8	Octane	C_8H_{18}
Butane	C_4H_{10}	Nonane	C_9H_{20}
Pentane	C_5H_{12}	Decane	$C_{10}H_{22}$

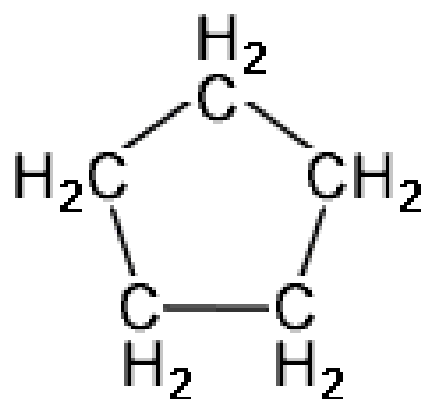
Alkene

- Have at least one double carbon-carbon bond
- General formula: C_nH_{2n}
- Unsaturated hydrocarbons
- Name: number of carbons + -ene

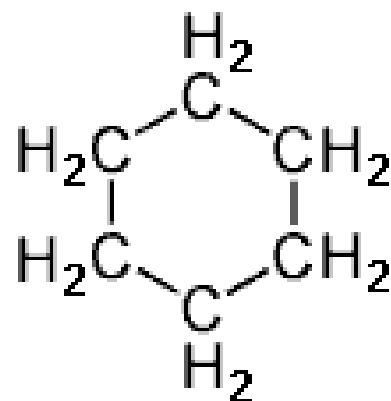


Cycloalkanes & cycloalkenes

- Some alkanes are ringed-shaped structures
- Name: cyclo- + number of carbons + -ane/-ene



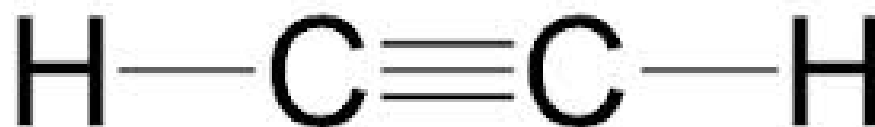
Cyclopentane



Cyclohexane

Alkyne

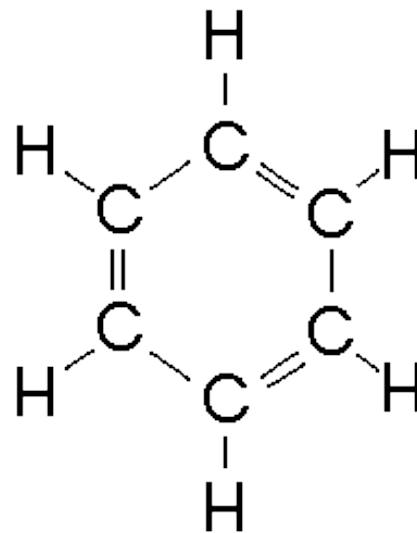
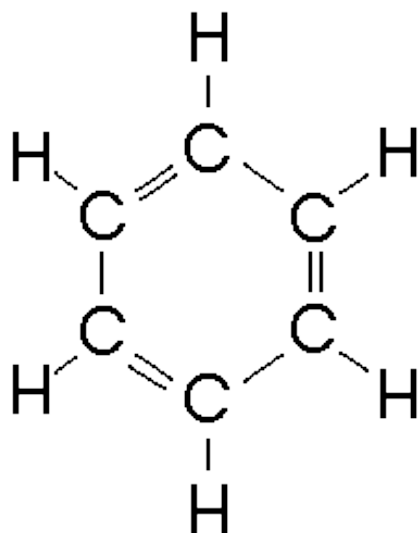
- Have at least one triple carbon-carbon bond
- General formula: C_nH_{2n-2}
- Unsaturated hydrocarbon
- Name: number of carbons + -yne



ethyne

Aromatics

- Cyclic unsaturated hydrocarbon
- Simplest structure = benzene
 - More complicated aromatic hydrocarbons are just “fused” benzene rings

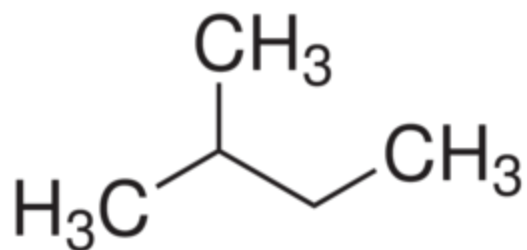


Functional Groups

- Atoms or groups of atoms attached to the hydrocarbon which have characteristic chemistry
- Several types:
 - Carbon side groups
 - Halide
 - Alcohol
 - Ether
 - Ketone
 - Aldehyde
 - Carboxylic acid
 - Ester
 - Amine

Carbon Side Groups

- Carbon chains that branch off the main hydrocarbon chain
- Named based on location on hydrocarbon chain
- Name: position # + carbon side group name + # of carbons + -ane/-ene/-yne



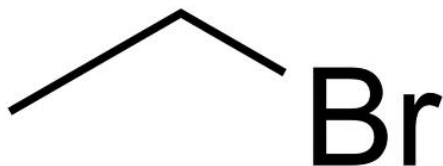
2-methylbutane

Group	Name
CH ₃ —	Methyl
CH ₃ CH ₂ —	Ethyl
CH ₃ CH ₂ CH ₂ —	Propyl
CH ₃ CH ₂ CH ₂ CH ₂ —	Butyl
$\begin{array}{c} \text{CH}_3 \\ \\ \text{HC}— \\ \\ \text{CH}_3 \end{array}$	Isopropyl
$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3—\text{C}— \\ \\ \text{CH}_3 \end{array}$	<i>t</i> -Butyl

Halides & Alcohols

- Halides

- Inclusion of any halogens
- Name: halogen prefix + # of carbons + -ane/-ene/-yne

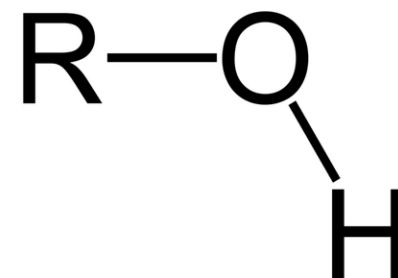
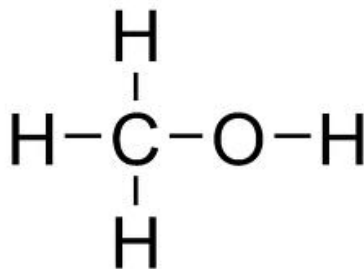


bromoethane

- Alcohols

- Include of hydroxide group
- Name: # of carbons + -an/-en/-yn + ol

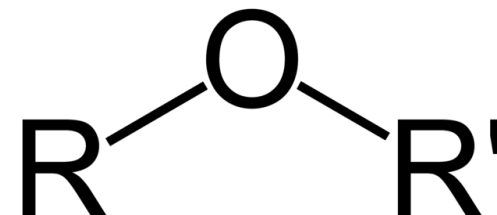
methanol



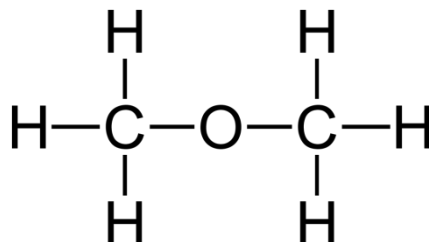
Ether & Ketone

- Ether

- Inclusion of an oxygen
- Name: # of carbon side groups + ether

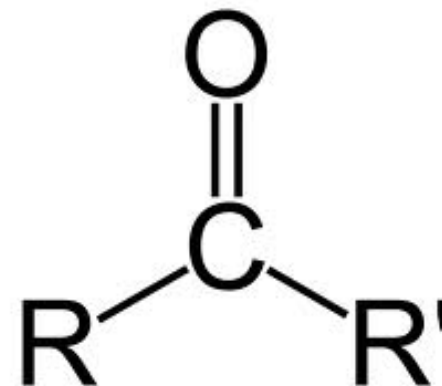


dimethyl ether

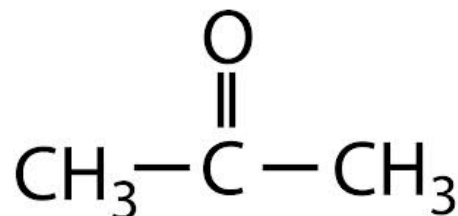


- Ketone

- Inclusion of a -CO group
- Name: # of carbons + -an/-en/-yn + -one



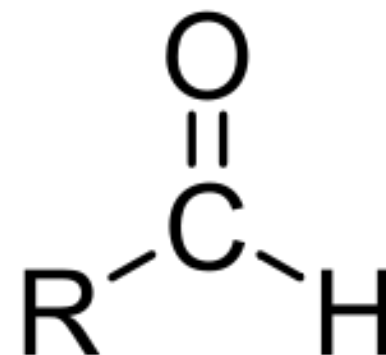
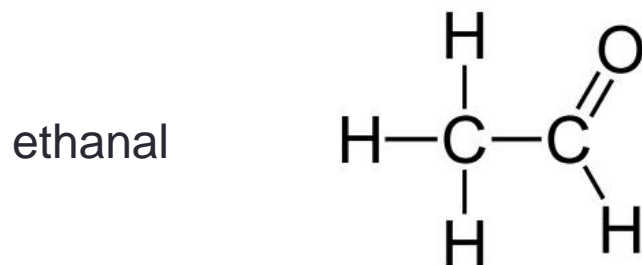
propanone



Aldehyde & Carboxylic Acid

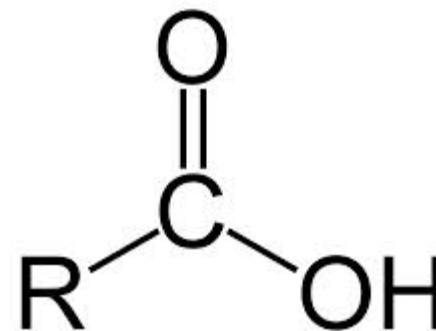
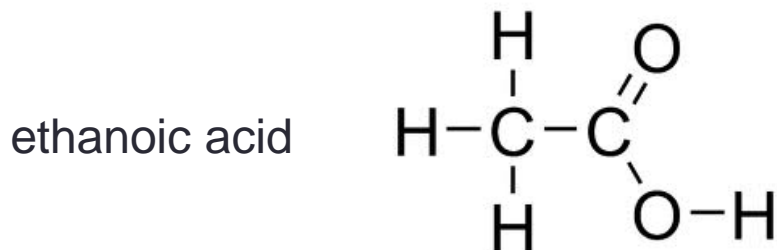
- Aldehyde

- Inclusion of -O-CH group
- Name: # of carbons + -an/-en/-yn + -al



- Carboxylic acid

- Inclusion of -CO-OH group
- Name: # of carbons + -ic + acid

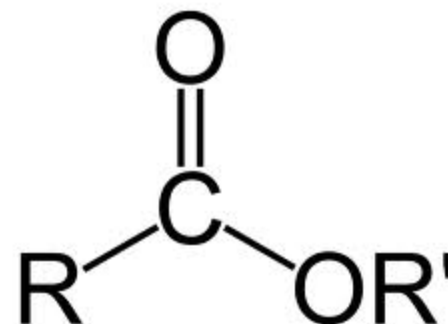
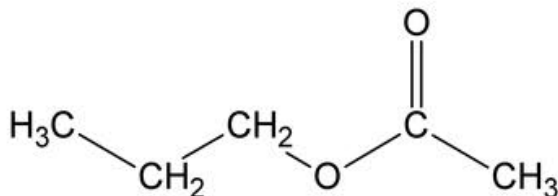


Ester & Amine

- Ester

- Inclusion of -CO-O group
- Name: # of carbons + -ate

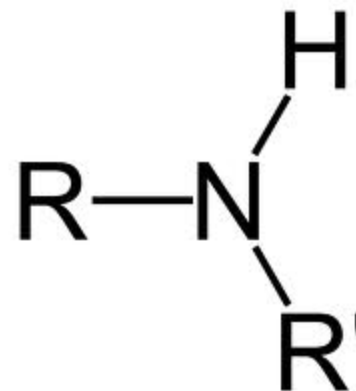
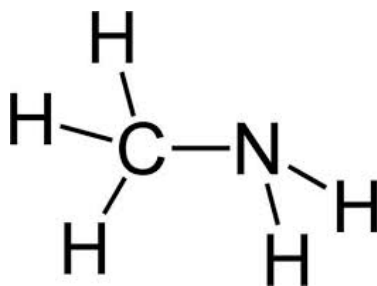
methyl ethanoate



- Amine

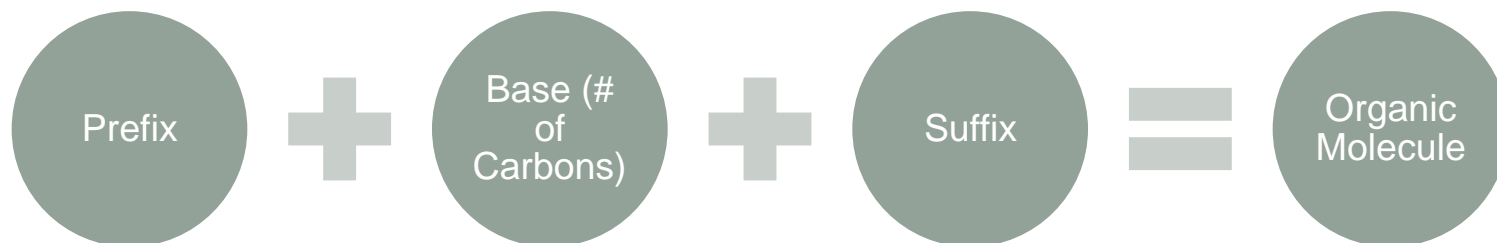
- Inclusion of nitrogen
- Name: # of carbon side groups + amine

methylamine



Naming Hydrocarbons

- 1) Find a chain within the molecule
- 2) Determine the number of bonds between carbon molecules:
 - Single = alkanes
 - Double = alkenes
 - Triple = alkynes
- 3) Name the chain according to the appropriate prefix
- 4) Determine which carbon molecules that any side carbon groups or functional groups are on
- 5) Name the carbon groups and functional groups



Example

- Name the following molecule

